

CLAIMS

What is claimed is:

1. A rayon fiber, possessing a composite crystalline structure of cellulose II and IV, which is prepared by 5 saponifying 75% or greater of the total acetyl groups of a cellulose acetate fiber.
2. The rayon fiber as set forth in claim 1, wherein the cellulose acetate fiber is selected from the group consisting of a cellulose diacetate fiber with a degree of 10 substitution ranging from 2.0-2.75, a cellulose triacetate fiber with a degree of substitution of at least 2.75, and a mixture thereof.
3. The rayon fiber as set forth in claim 1, wherein the rayon fiber has a breaking strength not greater than 15 2.5 gf/de and a breaking elongation of at least 20%.
4. The rayon fiber as set forth in claim 1, wherein the rayon fiber ranges, in specific gravity, from 1.45 to 1.51 gm/cm³.
5. The rayon fiber as set forth in claim 1, wherein 20 the rayon fiber ranges, in birefringence, from 0.012 to 0.024.
6. The rayon fiber as set forth in claim 1, wherein the rayon fiber ranges, in crystallinity, from 14 to 40 %.
7. A method for preparing a rayon fiber, comprising 25 the step of treating a cellulose acetate fiber with an alkali to saponify at least 75% of the total acetyl groups of the cellulose acetate fiber into hydroxyl groups, whereby the rayon fiber has a composite crystalline

structure of cellulose II and IV.

8. The method as set forth in claim 7 wherein the alkali is a strong alkali.

9. The method as set forth in claim 7 wherein the 5 cellulose acetate fiber is treated with a strong and a weak alkali in the same bath.

10. The method as set forth in claim 7 wherein the cellulose acetate fiber is treated with a strong alkali and a weak alkali in different baths.

10 11. The method as set forth in claim 7, wherein the cellulose acetate fiber is selected from the group consisting of a cellulose diacetate fiber with a degree of substitution ranging from 2.0-2.75, a cellulose triacetate fiber with a degree of substitution of at least 2.75, and 15 a mixture thereof.

12. The method as set forth in claim 7, wherein the alkali is supplemented with a saponification accelerator selected from the group consisting of a quaternary ammonium salt and a phosphonium salt.

20 13. A method for preparing a rayon fiber, comprising the step of treating a fiber material comprising cellulose acetate fibers with an alkali to saponify 75% or greater of the total acetyl groups of the cellulose acetate fibers into hydroxyl groups, said fiber material being selected 25 from the group consisting of a woven fabric, a knitted fabric fabric, and a non-woven fabric, whereby the rayon fiber has a composite crystalline structure of cellulose II and IV.

14. The method according to claim 13 wherein the cellulose acetate fibers are treated in combination with other fibers.

15. The method according to claim 13 wherein said fiber material is made by weaving, knitting or punching cellulose acetate fibers alone or in combination other fibers.

16. The method as set forth in claim 14 wherein the alkali is a strong alkali.

10 17. The method as set forth in claim 14 wherein the cellulose acetate fiber is treated with a strong and a weak alkali in the same bath.

15 18. The method as set forth in claim 14 wherein the cellulose acetate fiber is treated with a strong alkali and a weak alkali in different baths.

20 19. The method as set forth in claim 13, wherein the cellulose acetate fiber is selected from the group consisting of a cellulose diacetate fiber with a degree of substitution ranging from 2.0-2.75, a cellulose triacetate fiber with a degree of substitution at least of 2.75, and a mixture thereof.

25 20. The method as set forth in claim 13, wherein the alkali is supplemented with a saponification accelerator selected from the group consisting of a quaternary ammonium salt and a phosphonium salt.

21. A rayon fiber product, comprising a rayon fiber which possesses a composite crystalline structure of cellulose II and IV and is prepared by saponifying at

least 75% of the total acetyl groups of a cellulose acetate fiber with a degree of substitution of at least 2.0 into hydroxyl groups.

22. A method for producing a rayon fiber product,
5 comprising the step of treating a fiber material comprising cellulose acetate fibers with an alkali to saponify at least 75% of the total acetyl groups of the cellulose acetate fibers into hydroxyl groups, said fiber material being selected from the group consisting of a
10 woven fabric, a knitted fabric, and a non-woven fabric, said cellulose acetate fibers having a degree of substitution of at least 2.0, whereby the rayon fiber product has a composite crystalline structure of cellulose II and IV.

15 23. The method according to claim 22 wherein the cellulose acetate fibers are treated in combination with other fibers.

24. The method according to claim 22 wherein said fiber material is made by weaving, knitting or punching
20 cellulose acetate fibers alone or in combination other fibers.

25. The method as set forth in claim 23 wherein the alkali is a strong alkali.

26. The method as set forth in claim 23 wherein the cellulose acetate fiber is treated with a strong and a weak alkali in the same bath.

27. The method as set forth in claim 23 wherein the cellulose acetate fiber is treated with a strong alkali and a weak alkali in different baths.

28. The method as set forth in claim 22, wherein the cellulose acetate fiber is selected from the group consisting of a cellulose diacetate fiber with a degree of substitution ranging from 2.0-2.75, a cellulose triacetate fiber with a degree of substitution of at least 2.75, and a mixture thereof.

29. The method as set forth in claim 22, wherein the alkali is supplemented with a saponification accelerator selected from a the group consisting of quaternary ammonium salt and a phosphonium salt.

30. -A rayon film, which is prepared from a cellulose acetate film with a degree of substitution of at least 2:0 by saponifying at least 75 % of the total acetyl groups of the film into hydroxyl groups and possesses a composite crystalline structure of cellulose II and IV.

31. A method for producing a rayon film, comprising the step of treating a cellulose acetate film with an alkali to saponify at least 75% of the total acetyl groups of the cellulose acetate film into hydroxyl groups, whereby the rayon film has a composite crystalline structure of cellulose II and IV.

32. The method as set forth in claim 31 wherein the alkali is a strong alkali.

33. The method as set forth in claim 31 wherein the cellulose acetate fiber is treated with a strong and a weak alkali in the same bath.

34. The method as set forth in claim 31 wherein the cellulose acetate film is treated with a strong alkali and a weak alkali in different baths.

35. The method as set forth in claim 31, wherein
said cellulose acetate film is selected from the group
consisting of a cellulose diacetate film with a degree of
substitution ranges from 2.0-2.75, a cellulose triacetate
5 film with a degree of substitution at least 2.75, and a
mixture thereof.

36. The method as set forth in claim 31, wherein the
alkali is supplemented with a saponification accelerator
selected from the group consisting of a quaternary
10 ammonium salt and a phosphonium salt.